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“Não sou mas hei de ser…”

“E estou cada vez mais

perto de ser…”

Alcohol and the heart

Álcool e coração

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Resumo

Alguns dos efeitos benéficos da ingestão de álcool são já razoavelmente conhecidos. Contudo, os seus potenciais efeitos nefastos carecem ainda de avaliação mais detalhada. A caraterização desses efeitos em populações e contextos específicos é ainda escassa, particularmente em jovens adultos e em situações de consumo agudo e/ou em grandes quantidades. A síndroma do coração do fim-de-semana diz respeito ao desenvolvimento de uma arritmia cardíaca durante ou após o consumo agudo de uma grande quantidade de álcool, em indivíduo aparentemente saudável, e que normalmente reverte espontaneamente após um período de abstinência.

Este trabalho pretende rever o estado da arte relativamente à síndroma do coração de fim-de-semana, nomeadamente nos jovens adultos. Foram selecionados na *PubMed* artigos referentes ao consumo de álcool no jovem e ao desenvolvimento de arritmias cardíacas.

Nos adultos jovens observa-se uma acentuada heterogeneidade, no que respeita aos hábitos de consumo etílico. Neste artigo fez-se a descrição do efeito do álcool no coração e nas arritmias cardíacas, com referência a estudos eletrofisiológicos e a estudos clínicos. Abordou-se, igualmente, a questão da combinação do álcool com outras substâncias, nomeadamente com bebidas energéticas.

Concluiu-se que os estudos conhecidos no âmbito da síndroma do coração do fim-de-semana são escassos e as conclusões de alguns deles poderão encontrar-se enviesadas. Algumas questões sobre esta entidade clínica permanecem ainda sem

resposta e a sua resolução poderá ser útil na abordagem dos doentes jovens com arritmia cardíaca em contexto de ingestão de álcool.

Palavras-chave: Adultos jovens; álcool; arritmia; fibrilhação auricular; Síndroma do coração do fim-de-semana.

Abstract

Some of the beneficial effects of alcohol consumption are already reasonably well known. However, its potential harmful effects still require a more detailed evaluation. The characterization of these effects in specific populations and contexts are scarce, especially in young adults and in situations of acute consumption and/or in large amounts. The holiday heart syndrome is characterized by the development of a cardiac arrhythmia during or after an acute consumption of a large amount of alcohol in apparently healthy individuals, with an usual spontaneous reversion after a period of abstinence.

This paper aims to review the state of the art of holiday heart syndrome, especially in young adults. Articles related to alcohol consumption in young adults and the development of cardiac arrhythmias were selected in PubMed.

Among young adults we observed a marked heterogeneity regarding the alcohol consumption habits. In this article we made a description of the effects of alcohol on the heart and cardiac arrhythmia, with reference to electrophysiological studies and clinical trials. The combination of alcohol with other substances, particularly energy drinks, was also addressed.

We concluded that the studies related to holiday heart syndrome are scarce and the findings of some of them might be biased. Some questions about this clinical entity still remain unsolved and their answer might be useful in addressing the young patients with cardiac arrhythmia in the context of alcohol intake.

Keywords: Young adult; alcohol; arrhythmia; atrial fibrillation; holiday heart syndrome.

Table of abbreviations

Abbreviation	Meaning	Significado
AED	Alcohol combined with energy drinks	Álcool combinado com bebidas energéticas
AF	Atrial fibrillation	Fibrilhação auricular
ECG	Electrocardiogram	Eletrocardiograma
HHS	Holiday heart syndrome	Síndroma do coração do fim-de-semana
PAF	Paroxysmal atrial fibrillation	Fibrilhação auricular paroxística
SVT	Supraventricular tachycardia	Taquicardia supraventricular

Introduction

Alcohol is one of the most widely consumed psychoactive substances in the world, and has been a part of many cultures from the beginning of recorded history. Regardless of the kind and size, a standard alcohol-containing beverage typically contains 14 g of ethanol.[1] Alcohol consumption is usually measured per unit. One unit corresponds to 10 mL or 8 g of ethanol, which corresponds to the amount of alcohol that an average adult can metabolize in one hour.[1,2]

Ethanol absorption occurs in the stomach (20%) and small intestine (80%). After absorption, alcohol is metabolized in liver by alcohol dehydrogenase into acetaldehyde and then into acetic acid. About 2 to 5% of ingested alcohol is excreted without any change by exhaled air and urine. Acetaldehyde is highly reactive and toxic, and may contribute to hepatic damage. [3]

Peak plasma concentration of ethanol is reached between 30 and 90 min after ingestion. It is quick and uniformly distributed over all body tissues and fluids, and crosses the haematoencephalic and placental barriers. [2]

Some factors (i.e., variation in gastrointestinal function - gastric emptying, intestinal transit time, and portal blood flow) showed to significantly affect the rate of absorption of ethanol in healthy adult subjects. As around 20% of ingested ethanol is oxidised before it can be absorbed, the concomitant ingestion of food may inhibit and delay its absorption. Other factors such as drugs, alcohol content (absorption quickest between 20-30%), carbonated drinks (increase the rate of absorption) may also influence gastric emptying. [3]

The saying “double-edged sword” hold true for the alcohol, since its consumption might be toxic or beneficial depending on how it is used. [1] Several studies have reached a general consensus: light to moderate intake of alcohol (up to one drink per day in women and up to two drinks per day in men) has been shown to have beneficial effects on the cardiovascular system, a relationship described as a J-shaped (or U-shaped) curve. [4] Over many years, there have been criticism of the interpretation of this association. The J-shaped association between alcohol intake and cardiovascular disorders applies to regular low to moderate alcohol intake but not binge drinking. [5] On the other hand, consumption of high volumes of alcohol for a long period of time has been linked to poisonings, accidents, violence, cirrhosis, progressive cardiac dysfunction, heart failure, seizures and many malignancies including cancers of the larynx, pancreas, female breast, liver, colon and rectum. [6,7] Among the cardiovascular effects, alcohol abuse may lead to development of alcoholic cardiomyopathy, systemic hypertension, conduction disorders and other dysrhythmias and stroke. [8,9]

Currently, alcohol consumption is observed, not only in the higher age groups, but also among young people and adolescents, particularly aged 15 to 29 years old. [10] Furthermore, consumption patterns of alcoholic beverages have changed and binge drinking has generalized, namely in young age groups. [11] Its implications for the individual health are not well understood.

This article aims to discuss the physiological mechanisms through which acute alcohol ingestion may cause heart damage, and the potential Holiday Heart Syndrome (HHS) risks associated with alcohol ingestion in young adults.

This review was based on a comprehensive literature search of PubMed (January 1960 to February 2016) using the search terms: “alcohol”, “ethanol”,

“cardiac arrhythmia”, “holiday heart syndrome”, “young adult” and combinations of these terms. Articles aiming only chronic alcohol consumption and its effects on heart were not included. Additionally, the reference lists of the identified articles were manually examined to search for additional relevant articles. Studies were considered to this review if they were deemed to be of high quality, objective, and methodologically adequate.

Drinking habits

Rehm *et al* described a conceptual model for the impact of alcohol intake on disease morbidity and mortality and the influence of sociodemographic factors on alcohol intake and alcohol-related disorders (Figure 1). [12] Taking into account the proposed model, the overall volume of alcohol intake has impact in all alcohol-related disorders, whereas drinking patterns only play a role in ischemic cardiovascular diseases. With respect to the quality of the alcoholic beverages consumed, it may influence mortality and morbidity from chronic diseases and conditions. [7,12] However, this variable has a smaller impact than the other two factors. [13,14]

Age, sex and other biological factors, as well as the setting and context where the alcohol consumption takes place, may have influence on the degree of adverse health outcomes and can help defining vulnerable groups and individuals who may have an increased susceptibility to the toxic, psychoactive and dependence-producing properties of ethanol. [10,12]

Typically, alcohol consumption begins in adolescence. Across North American and European countries, the prevalence of weekly drinking was 2% among 11-year-olds, 4% among 13-year-olds and 21% among 15-year-olds. [15]

Binge drinking (defined as a consumption of five or more drinks on one occasion [usually defined as 2 hours] or by the subjective feeling of drunkenness) has received increasing interest in the past decade. This alcohol consumption pattern has more incidence in late adolescence and early adulthood (between the ages of 16 and 30) than in any other period in life and its prevalence rates are higher among the

male gender. [16] In 2013, a total of 20.8% of high school students reported binge drinking in the past month, highlighting an annual 2.9% decrease since 2005. [17]

The referred age range also includes the age when young people in North American and many European countries are legally allowed to buy and drink alcohol. Specifically, in USA the minimum legal drinking age is 21 years, whereas in Europe there is different legislation in place as regards on-premises drinking and off-premises purchasing of alcohol, at least for non-distilled beverages, which can often be legally purchased at the age of 16 or 18 years. It should be noted that this age range includes a period of neurological and psychosocial immaturity. [18]

Drinking patterns generally change over the life cycle. The volume of drinking usually increases until early adulthood and then remains relatively stable until retirement age, with some slight fluctuations in some countries. [19] In the other hand, in many countries, binge drinking prevalence and frequency increase sharply across the adolescent years, peak in young adulthood and subsequently decrease until retirement age. [20] Binge drinking differ according to adult and adolescent drinking culture, with more binge drinking in the northern and middle parts of Europe compared to the southern countries. [20] Thus, a variety of socio-demographical and individual conditions associated with binge drinking have been described [18].

The holiday heart syndrome

In the 70's, Ettinger conducted a study, assessing 32 independent arrhythmic events in 24 patients, which found an association between acute alcohol intake and development of cardiac arrhythmias. These subjects had consumed alcohol heavily and regularly and they took part in a weekend or holiday drinking binge immediately prior to evaluation. According to those results, Ettinger introduced the term HHS to describe an acute cardiac rhythm and/or conduction disturbance, related to heavy drinking (i.e., "binge drinking") in apparently healthy individuals, with rapid and spontaneous recovery during subsequent abstinence, leaving no residual heart disease. [21] Currently, HHS refers to the association between alcohol use and rhythm disturbances in apparently healthy people. [22]

Generally, HHS is associated with supraventricular tachyarrhythmia. Atrial fibrillation (AF) is the most common, followed by atrial flutter and isolated ventricular premature beats. Isolated multiple supraventricular beats and paroxysmal atrial tachycardia may occur as well. [21]

In terms of symptomatology, palpitations is the most frequent symptom reported by patients with HHS. Other symptoms commonly reported are precordial pressure or pain, syncope and dyspnea. However, it is important to note that cardiac arrhythmias, such as AF, can also occur without any clinical symptoms, making diagnosis of HHS difficult for physicians, which can lead to an underestimation of its incidence. During admission of a patient with a symptomatic tachyarrhythmia, a high suspicion of HHS should be admitted if the patient exhibits signs of alcoholic intoxication or had a recent episode of binge drinking. Therefore, physicians should

perform a detailed collection of patients' medical history, which should include alcohol use and misuse. [22] Patients with these rhythm disturbances are apparently healthy, with no personal or family history of palpitations or other suggestive symptoms of structural cardiac anomalies or any clinical evidence of heart disease such as cardiomyopathy, cardiac valvular disease, coronary heart disease, or other conditions that could lead to cardiac arrhythmias, such as abnormal electrolyte levels or elevated thyroid hormone levels, and laboratory and other tests are usually normal. Thus, appropriate investigations including routine blood tests, thyroid function tests, transthoracic echocardiogram, and 24-hour Holter monitoring should be performed to these patients according to current guidelines. [23]

After confirming the cardiac dysrhythmia and excluding evident heart disease, the physician should recommend alcohol abstinence since this clinical condition usually resolves spontaneously to normal sinus rhythm within 24 hours with abstinence. Occasionally, the need for pharmacological or electrical cardioversion may be required. After returning to normal sinus rhythm, the electrocardiograms (ECG) are also mostly normal. [8] In case the AF does not revert to sinus rhythm, the management should follow current Guidelines. [23] Typically, the arrhythmia does not recur with sustained abstinence. [8]

However, there are some controversies surrounding HHS. First, some studies reported lower incidence of the onset of dysrhythmia during the weekend and they did not find any particular accumulation of alcohol-related arrhythmias close to New Year's or May Day. [24,25] Another point of disagreement is whether the development of dysrhythmia would occur during acute ingestion of alcohol, some hours later, or in the hangover period. [2]

Effects of alcohol in cardiac arrhythmias

Although the acute cardiac arrhythmias has been recognized as a consequence of acute and excessive alcohol consumption, the mechanisms behind this association remain unresolved. These may be direct toxic effects of alcohol on the heart (i.e., cardiotoxicity); or indirect (by alcohol derived metabolites or effects on other organs such as adrenal glands) [26], including increased cardiac sympathetic activity (i.e., hyperadrenergic activity) during both drinking and withdrawal [27]; impairment of the parasympathetic nervous system (i.e., of vagal tone) [28]; changes in atrial conduction properties; rise in plasma free fatty acids [29] and electrolyte imbalance (i.e., hypomagnesemia and hypokalemia). [30]

Electrophysiologic studies

Several studies have been conducted to evaluate the electrophysiological proprieties of alcohol, most of them were based on *in vitro* studies or performed in animals. Studies with humans were also conducted, although they have in most of them limited number of patients.

Cardiac conduction interference: It is postulated that acute alcohol ingestion interferes with the cardiac conduction system, leading to slowing of conduction, which could facilitate re-entry phenomena. In this context, some experimental studies in humans and animals were performed. In an experimental study using eleven dogs, Ettinger *et al* observed prolongation of the HV interval in one dog and QRS widening in other dog after acute alcohol infusion. [31] Two years later, in the original HHS study,

Ettinger *et al* detected prolongation of PRc, QRS and QTc intervals in humans, confirming their theory. [21] In other study conducted by Cardy *et al*, a prolongation of P and QRS intervals in ECG evaluation were found in 13 patients after acute ingestion of alcohol, suggesting atrial and ventricular conduction slowing. Although controls also showed the same alterations in the ECG evaluation, these changes were significantly more pronounced in the group where the alcohol ingestion occurred. [32]

Some years later, an *in vitro* study conducted by Klein *et al* suggested a possible mechanism for the cardiac conduction interference caused by acute alcohol ingestion. The authors found that ≥2 g/L alcohol has an inhibitory effect on cardiac sodium channels which can increase sodium-calcium-exchanger activity. This inhibitory effect led to prolongation of the action potential and repolarization, with subsequent prolongation of intervals such as the QT interval, facilitating the onset of cardiac arrhythmias. For concentrations <2 g/L, inhibition was not significant, indicating that this mechanism would be more likely to happen with acute heavy ingestion. [33]

Refractory period shortening: In a study performed by Gimeno *et al*, using rat atrial tissue, it was demonstrated that alcohol could shorten the atrial refractory period and may predispose the atria to dysrhythmias, such as ectopic beats and fibrillation. [34] Latter, a study conducted in humans confirmed these observations by founding a shortened refractory period associated with alcohol intake. [35]

Clinical studies

After Ettinger's original description of HHS, the causal relation between binge drinking and the onset of cardiac arrhythmias has been a center of interest among scientific community and a wide range of studies have been conducted (Table 1).

A few years after Ettinger's study, Engel *et al* tested the susceptibility to AF and flutter after whisky consumption in alcohol abusers who did not have cardiac disorders, specifically cardiomyopathy or heart failure. Two thirds of study subjects developed arrhythmia after consuming whisky, proving the higher susceptibility to arrhythmia caused by ingestion of this kind of beverage and corroborating HHS. [36]

Latter, in 1984, Thornton found the same association and published a case series, showing four cases of cardiac arrhythmia after alcohol intake in persons who usually did not consume alcohol. [37]

The etiological role of alcohol in new onset AF was evaluated in a case-control study conducted by Koskinen *et al*, of 100 consecutive patients, including 35 with no evidence of cardiac disease. The authors found an association between recent alcohol intake (previous two days) and AF. However, unlike the original HHS study, the frequencies of the onset of AF were lowest during the weekend and in the days afterwards and highest in the middle of the week. These findings could be due to the increased mental and physical stress during working week, which can increase sympathetic tonus, together with other factors, such as alcohol, contribute to the onset of AF. The authors also estimated that approximately 15%–30% of idiopathic AF cases could be related to alcohol abuse. [25]

Wannamethee *et al* performed a prospective study about alcohol ingestion and sudden death. Although the focus of the study was not the HHS, they noted that patients in the younger age groups (40 and 49 years of age) without ischemic heart

disease and with occasional drinking habits had an incidence of sudden death similar to heavy drinkers, proposing that some of these occasional drinkers may take part in binge drinking, which is associated with HHS, leading to cardiac arrhythmias that may result in sudden death. [38]

A study conducted by Krishnamoorthy *et al* analysed subjects admitted to the hospital with a diagnosis of AF or atrial flutter confirmed by ECG, precipitated by either alcohol or illicit drugs. In 22 patients, alcohol (n = 19) and/or illicit drugs (n = 3) were found to be the precipitant of the symptoms. Furthermore, in this study most patients (85%) were followed-up for at least 12 months, verifying relapses in all those who continued to abuse either alcohol or illicit drugs, which reinforces the motivation to suggest abstinence as a prophylactic measure. [39]

The study performed by Mandyam *et al* compared patients with paroxysmal atrial fibrillation (PAF) against patients with supraventricular tachycardia (SVT) to evaluate the effects of alcohol ingestion in precipitation of PAF, since alcohol appears to trigger PAF in the absence of a true causal association. Patients with PAF had greater odds of reporting alcohol intake before a PAF episode compared with the SVT group. As a conclusion, they found alcohol consumption and vagal activity elicit PAF significantly more often than SVT. Taking into account that alcohol and vagal triggers often were found in the same PAF patients, it is possible that alcohol may lead to AF via vagal mechanisms. [28]

Liang *et al* analyzed data from subjects who participated in two large antihypertensive drug treatment trials (Ongoing Telmisartan Alone and in Combination with Ramipril Global Endpoint Trial – ONTARGET - and Telmisartan Randomized Assessment Study in ACE Intolerant Subjects with Cardiovascular Disease – TRANSCEND - trials) and who had no AF at baseline. Within the

moderate alcohol intake group, binge drinkers (defined as alcohol intake of >5 drinks/day) were associated with an increased risk of AF compared with non-binge drinkers, reaching a similar risk of AF as heavy drinkers (>3 drinks/day for men and >2 drinks/day for women). [40]

Combining alcohol and other substances

Globally, there is a growing tendency for people to consume multiple substances, either at different times or combined, which could increase the ability of those substances to cause harmful effects. [41] There is a growing body of evidence, demonstrating increasing consumption of alcohol combined with energy drinks (AED), particularly among young adults. [42] Around the early 2000s, energy drinks became a popular mixer with alcohol, particularly with spirits and, some years later, pre-packaged alcohol energy drinks appeared on the market. Nowadays, this phenomenon seems to be general and an integral part of the night-time economy. [43]

Only three studies were conducted to evaluate consumption rates of AED and all of them showed that between one quarter and one half of university students reported consuming an AED in the past month. [44–46] An observational study indicated that while some young people report using AEDs to attenuate feelings of drunkenness (consistent with motivations for combining alcohol with illicit stimulants), others assume using AEDs to facilitate intoxication. [43]

Energy drinks are products that announce to offer stimulant effect on central nervous system. They vary in typical ingredients but most use caffeine (the major active ingredient), other plant-based stimulants (e.g., yerba mate, guarana), simple sugars or other sweeteners (e.g., fructose, glucose), glucuronolactone (a naturally occurring glucose metabolite), amino acids (e.g., taurine, creatine, carnitine), herbs

(e.g., ginseng, ginkgo biloba) and vitamins. The effects of these list of ingredients are not completely understood. [47]

The combination of alcohol and energy drinks could be an important source of three main harms. The consumption of AED is associated with increased likelihood of reporting heart palpitations, tremors, speeded speech, agitation, and sleeping disorders as compared with consumption of alcohol alone. [42]

The first is the reduced sensitivity to the symptoms and signs of alcohol intoxication [48], thereby increasing the likelihood of alcohol poisoning and impaired judgment leading to accidents, poor decision making and risky behaviour. Another harm consists of dehydration which could lead to nausea, increased heart rate, headaches, muscle cramps, fatigue and more severe hangover. [42,49] Lastly, AED may promote sending of miscellaneous information to the nervous system leading to development of cardiovascular sleep disorders. [42]

In the nightlife, which is the most common context for binge drinking, other behaviours are also common, namely the illicit drugs use. It is clear the lack of studies on the association between new onset AF in young patients involved in illicit drug abuse [39]. The scenario becomes more alarming when it is verified that there is no literature on the link between dysrhythmia and drug and alcohol use.

Conclusions and future perspectives

Currently, alcohol consumption represents an important public health problem since it is a risk factor for a wide variety of social, financial, legal and relationship problems for individuals and their families. [50] Binge drinking, previously described, is more usual in late adolescence and early adulthood and one of it precocious consequence is the HHS.

Important weak points of some studies include its design (case-series or observational studies), small sample size, incomplete follow-up of subjects and the source of information on some of covariates (i.e., self-reported information about alcohol consumption and history of concomitant cardiovascular). [16]

The sample characteristics and some data related to each subject could be an additional source of confounding variables. Thus, some parameters related to the alcohol-consumer should be considering, particularly, gender, age and weigh, since all these variables will be important factors when discussing levels of alcohol consumption.

Most studies do not differentiate the effects of single occasion drinking in moderate drinkers from those in chronic heavy drinkers, who may have more tolerance and have more experience on handling these effects at equivalent blood alcohol concentration levels. Also, traditional cohort studies establishing causal links between exposure and chronic outcomes often assess exposure just once, ignoring other damages, and link this single event to later outcomes, leading to biased conclusions.[16]

Additionally, as the legal age for alcoholic beverage consumption differs between countries, it is not always easy to evaluate the magnitude of this type of consumption in this population, since access to alcohol is different and this may trigger different behaviour.

Accumulating evidence strongly suggests that light to moderate alcohol intake has beneficial effects on cardiovascular effects and its risk factors. [50] On the other hand, there seems to be a large amount of data that supports the arrhythmogenic effect of alcohol, especially in high doses, and its importance in AF development. [51] However, there is currently no clear consensus of opinion or treatment guidelines for such patients. [39] Apart from abstinence, the optimal management of such patients and long-term effects of these substances on the heart and AF recurrences are still unclear.

The difficulties that researchers go through when they want to study the effects of binge drinking in the heart are evident, especially when the study population is this age group. Thus, it is clear the paucity of papers focused on young adults and acute intake of alcohol.

The main reason to focus this work on young adults is due to the fact that they do not present cardiovascular disorders at baseline or, at least, do not present aging-related alterations. Related to HHS in young people, some questions still remain unclear: “Do we know the real incidence of HHS or will it be underestimated?”, “Should we consider a genetic variability related to different susceptibility to alcohol?”, “Which deleterious effects does HHS have in a healthy heart?”, “Does HHS cause a permanent lesion in heart with long-term repercussions?”, “Should physicians prescribe a specific treatment in young adults with HHS?”.

Solving these and other questions will help to handle this issue of alcohol consumption in young people.

Conflicts of interest

The authors have no conflicts of interest to declare.

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Figure legend

Figure 1: Causal model of alcohol consumption, intermediate mechanisms, long-term consequences and socio-demographic factors on alcohol related harms (adapted from [7,12,19]).

Table

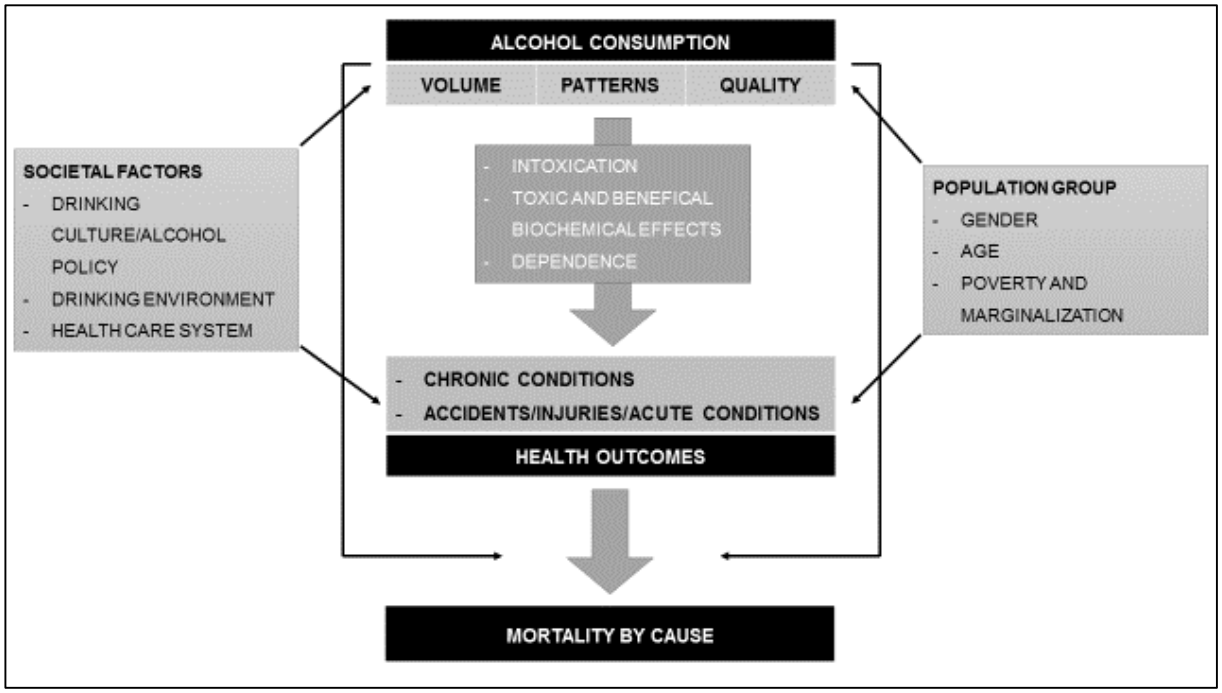
Table 1: Characteristics of studies of acute alcohol consumption and atrial fibrillation development.

Authors; year; country	Study design	n	Sex; ages range (years)	Key findings
Ettinger *et al* [21]; 1978; USA	Observational	32	Both; 25-62	First description of HHS. Association between binge drinking and dysrhythmias.
Engel *et al* [36]; 1983; USA	Prospective observational	14	Men; 43-75	Higher susceptibility to AF and atrial flutter development after whisky consumption.
Thornton [37]; 1984; UK	Case series	4	Both; 34-47	Association between binge drinking and AF in non-alcoholic people.
Koskinen *et al* [25]; 1987; Finland	Case-control	100	Both; 21-64	Increased incidence of AF related to recent (previous two days) alcohol consumption (>30g/day). Association between holidays and weekend and prevalence of AF onset were not found.

Wannamethee *et al* [38]; 1992; UK	Cohort Prospective	7,735	Men; 40-59	Occasional and heavy drinkers had similar incidence of sudden death. Possible association between binge drinking and sudden death.
Krishnamoorthy *et al* [39]; 2009; UK	Case series	88	Both; 20-45	Mora than 25% of patients consumed alcohol before onset of symptoms. Recurrences were found in all patients who had maintained alcohol abuse.
Mandyam *et al* [28]; 2012; USA	Case-control	223	Both; NA	Alcohol consumption triggered PAF significantly more often than SVT.
Liang *et al* [40]; 2012; 40 countries worldwide	Cohort Prospective	30,433	Both; ≥55	Among moderate alcohol consumer, binge drinkers had an increased risk of atrial fibrillation compared with non–binge drinkers.

AF: Atrial fibrillation; NA: Not available; HHS: Holiday heart syndrome; PAF: paroxysmal atrial fibrillation; STV: Supraventricular tachycardia.

Figure 1


ALCOHOL CONSUMPTION
VOLUME
PATTERNS
QUALITY
- INTOXICATION
- TOXIC AND BENEFICAL BIOCHEMICAL EFFECTS
- DEPENDENCE
SOCIETAL FACTORS
- DRINKING CULTURE/ALCOHOL POLICY
- DRINKING ENVIRONMENT
- HEALTH CARE SYSTEM
POPULATION GROUP
- GENDER
- AGE
- POVERTY AND MARGINALIZATION
- CHRONIC CONDITIONS
- ACCIDENTS/INJURIES/ACUTE CONDITIONS
HEALTH OUTCOMES
MORTALITY BY CAUSE

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Ao meu Pedrinho…

Anexos

Normas de publicação da Revista Portuguesa de Cardiologia

A Revista Portuguesa de Cardiologia, órgão oficial da Sociedade Portuguesa de Cardiologia, é uma publicação científica internacional destinada ao estudo das doenças cardiovasculares.

Publica artigos em português na sua edição em papel e em português e inglês na sua edição online, sobre todas as áreas da Medicina Cardiovascular. Se os artigos são publicados apenas em inglês, esta versão surgirá simultaneamente em papel e online. Inclui regularmente artigos originais sobre investigação clínica ou básica, revisões temáticas, casos clínicos, imagens em cardiologia, comentários editoriais e cartas ao editor. Para consultar as edições online deverá aceder através do link www.revportcardiol.org.

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Apresentação do documento:

- Com espaço duplo, margens de 2,5 cm e páginas numeradas.
- Não deverão exceder 5.000 palavras, contadas desde a primeira à última página, excluindo as tabelas.
- Consta de dois documentos: primeira página e manuscrito
- O manuscrito deve seguir sempre a mesma ordem: a) resumo estruturado em português e palavras-chave; b) resumo estruturado em inglês e palavras-chave; c) quadro de abreviaturas em português e em inglês; d) texto; e) bibliografia; f) legendas das figuras; g) tabelas (opcional) e h) figuras (opcional)-

Primeira página

Título completo (menos de 150 caracteres) em português e em inglês.

Nome e apelido dos autores pela ordem seguinte: nome próprio, seguido do apelido (pode conter dois nomes)

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O resumo, com um máximo de 250 palavras, está dividido em quatro partes: *a)* Introdução e objectivos; *b)* Métodos; *c)* Resultados e *d)* Conclusões.

Deverá ser elucidativo e não inclui referências bibliográficas nem abreviaturas (excepto as referentes a unidades de medida).

Inclui no final três a dez palavras-chave em português e em inglês. Deverão ser preferencialmente seleccionadas a partir da lista publicada na Revista Portuguesa de Cardiologia, oriundas do Medical Subject Headings (MeSH) da National Libray of Medicine, disponível em: www.nlm.nihgov/mesh/meshhome.html.

O resumo e as palavras-chave em inglês devem ser apresentados da mesma forma.

Texto

Deverá conter as seguintes partes devidamente assinaladas: *a)* Introdução; *b)* Métodos; *c)* Resultados; *d)* Discussão e *e)* Conclusões. Poderá utilizar subdivisões adequadamente para organizar cada uma das secções.

As abreviaturas das unidades de medida são as recomendadas pela RPC (ver Anexo II).

Os agradecimentos situam-se no final do texto.

Bibliografia

As referências bibliográficas deverão ser citadas por ordem numérica no formato 'superscript', de acordo com a ordem de entrada no texto.

As referências bibliográficas não incluem comunicações pessoais, manuscritos ou qualquer dado não publicado. Todavia podem estar incluídos, entre parêntesis, ao longo do texto.

São citados abstracts com menos de dois anos de publicação, identificando-os com [abstract] colocado depois do título.

As revistas médicas são referenciadas com as abreviaturas utilizadas pelo Index Medicus: List of Journals Indexed, tal como se publicam no número de Janeiro de cada ano. Disponível em: http://www.ncbi.nlm.nih.gov/entrez/citmatch_help.html#JournalLists.

O estilo e a pontuação das referências deverão seguir o modelo Vancouver 3.

Revista médica: Lista de todos os autores. Se o número de autores for superior a três, incluem-se os três primeiros, seguidos da abreviatura latina et al. Exemplo:

17. Sousa PJ, Gonçalves PA, Marques H et al. Radiação na AngioTC cardíaca; preditores de maior dose utilizada e sua redução ao longo do tempo. Rev Port cardiol, 2010; 29:1655-65

Capítulo em livro: Autores, título do capítulo, editores, título do livro, cidade, editora e páginas. Exemplo:

23. Nabel EG, Nabel GJ. Gene therapy for cardiovascular disease. En: Haber E, editor. Molecular cardiovascular medicine. New York: Scientific American 1995. P79-96.

Livro: Cite as páginas específicas. Exemplo:

30. Cohn PF. Silent myocardial ischemia and infarction. 3rd ed. New York: Mansel Dekker; 1993. P. 33.

Material electrónico: Artigo de revista em formato electrónico. *Exemplo:*

Abood S. Quality improvement initiative in nursing homes: the ANA acts it an advisory role. Am J Nurs. [serie na internet.] 2002 Jun citado 12 Ago 2002:102(6): [aprox. 3] p. Disponível em: http://www.nursingworld.org/AJN/2002/june/Wawatch.htm

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As figuras correspondentes a gráficos e desenhos são enviadas no formato TIFF ou JPEG de preferência, com uma resolução nunca inferior a 300 dpi e utilizando o negro para linhas e texto. São alvo de numeração árabe de acordo com a ordem de entrada no texto.

- A grafia, símbolos, letras, etc, deverão ser enviados num tamanho que, ao ser reduzido, os mantenha claramente legíveis. Os detalhes especiais deverão ser assinalados com setas contrastantes com a figura.
- As legendas das figuras devem ser incluídas numa folha aparte. No final devem ser identificadas as abreviaturas empregues por ordem alfabética.
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N° máximo de palavras do Resumo - 250
N° máximo de Figuras - 10
N° máximo de quadros - 10
N° máximo de ref. bibliográficas - 100

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- Os autores (máximo seis), proveniência, endereço e figuras serão especificados de acordo com as normas anteriormente referidas para os artigos originais.
- O texto explicativo não pode exceder as 250 palavras e contem informação de maior relevância, sem referências bibliográficas. Todos os símbolos que possam constar nas imagens serão adequadamente explicados no texto.
- Contêm um número máximo de quatro figuras.

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Para assegurar que o material tenha o formato apropriado recomendamos o seguinte:

	Formato	Extensão	Detalhes
Texto	Word	.doc ou docx	Tamanho máximo 300 Kb
Imagem	TIFF	.tif	Tamanho máximo 10MB
Audio	MP3	.mp3	Tamanho máximo 10MB
Vídeo	WMV	.wmv	Tamanho máximo 30MB

Os autores deverão submeter o material no formato electrónico através do EES como arquivo multimédia juntamente com o artigo e conceber um título conciso e descritivo para cada arquivo.

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ANEXO I

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Título .....

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Nome dos autores:

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.....

Assinaturas:

ANEXO II

Símbolos, abreviaturas de medidas ou estatística

Designação	Português	Inglês
Ampere	A	A
Ano	ano	yr
Centímetro quadrado	cm_2	cm_2
Contagens por minuto	cpm	cpm
Contagens por segundo	cps	cps
Curie	Ci	Ci
Electrocardiograma	ECG	ECG
Equivalente	Eq	Eq
Grau Celsius	°C	°C
Grama	g	g
Hemoglobina	Hb	Hb
Hertz	Hz	Hz
Hora	h	h
Joule	J	J
Litro	L ou L	l ou L
Metro	m	m
Minuto	min	min
Molar	M	M
Mole	mol	mol
Normal (concentração)	N	N
Ohm	Ω	Ω
Osmol	osmol	osmol
Peso	peso	WT
Pressão parcial de CO_2	pCO_2	pCO_2
Pressão parcial de O_2	pO_2	pO_2
Quilograma	kg	kg
Segundo	s	sec
Semana	Sem	Wk
Sistema nervoso central	SNC	CNS
Unidade Internacional	UI	IU
Volt	V	V
Milivolt	mV	mV
Volume	Vol	Vol
Watts	W	W
Estatística:		
Coeficiente de correlação	r	r
Desvio padrão (standard)	DP	SD
Erro padrão (standard) da média	EPM	SEM
Graus de liberdade	gl	df
Média	χ	χ
Não significativa	NS	NS
Número de observações	n	n
Probabilidade	p	p
Teste «t» de Student	teste t	t test